

2025 END OF SEMESTER EXAMS – MATHEMATICS (ELECTIVE) 1

FORM TWO

PAPER ONE

(40 Marks)

OBJECTIVE TEST – ANSWER ALL QUESTIONS

Think carefully before you shade the answer spaces; erase completely any answers you wish to change. Do all rough work on this question paper. Now answer the following questions

1. If $3(3^{2x}) = \frac{1}{27}$, find the value of x
(a) 2 (b) $-\frac{3}{2}$ (c) $\frac{3}{2}$ (d) -2
2. Given that $3\log_{10}y + \log_{10}x - 2 = 0$, express in terms of y
(a) $\frac{2}{3y}$ (b) $\frac{100}{y^3}$ (c) $\frac{1000}{y}$ (d) $x = 2 - 3y$
3. If $2^x = 5$, find the value of x
(a) 4.31 (b) 3.32 (c) 2.23 (d) 0.32
4. For what value of x will $\log_2 4x + \log_2(x + 4) = 7$?
(a) 2 (b) 4 (c) 6 (d) 8
5. Given that -6, $-2\frac{1}{2}$,, 71 is a linear sequence, calculate the number of terms in the sequence.
(a) 20 (b) 21 (c) 22 (d) 23
6. The product of the second and third terms of an exponential sequence (GP) is 972. If the first term is $\frac{3}{4}$, find the common ratio.
(a) 8 (b) 10 (c) 11 (d) 12
7. If a series is given by $1 + \frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \dots$, find the sum to infinity of the series
(a) $\frac{3}{2}$ (b) $\frac{4}{3}$ (c) $\frac{1}{3}$ (d) $\frac{3}{4}$
8. If 36, p, $\frac{9}{4}$ and q are consecutive terms of an exponential sequence (GP), find the sum of p and q.
(a) $\frac{9}{16}$ (b) $\frac{81}{16}$ (c) $\frac{9}{4}$ (d) $9\frac{9}{16}$
9. Solve $3^{2x} - 3^{x+2} = 3^{x+1} - 27$
(a) 1 or 0 (b) 1 or 2 (c) 1 or -2 (d) -1 or 2
10. Simplify $(1 - \sqrt{2})^4$
(a) $1 - 12\sqrt{2}$ (b) $9 - 6\sqrt{2}$ (c) $17 - 2\sqrt{2}$ (d) $5 - 2\sqrt{2}$
11. Find the co-efficient of x^3 in the binomial expansion of $(x - \frac{a}{2})^6$
(a) $-\frac{5}{2}a^3$ (b) $-\frac{5}{2}a^2$ (c) $\frac{5}{2}a^2$ (d) $\frac{5}{2}a^3$

12. The coefficient of x^3 in the expansion of $(k + 3x)^4$ is 54. Find k
 (a) 3 (b) 2 (c) $\frac{1}{2}$ (d) $\frac{3}{2}$
13. Express $3\log_{10} x - \frac{1}{2}\log_{10} y + 1$ as a single logarithm
 (a) $\log_{10} \left(\frac{10}{x^3\sqrt{y}} \right)$ (b) $\log_{10} \frac{x^3}{\sqrt{y}}$ (c) $\log_{10} \frac{3x}{\sqrt{y}}$ (d) $\log_{10} \frac{10x^3}{\sqrt{y}}$
14. Given that $\log_{10} p = 2$ and $\log_p 5 = r$, find the value of r
 (a) $\frac{1}{2} \log_{10} 5$ (b) $\frac{\log 5}{\log 2}$ (c) 1 (d) 25
15. What is the co-efficient of x^4y^2 in the binomial expansion in $(2x + y)^6$?
 (a) 96 (b) 120 (c) 160 (d) 240
16. Find the ratio of the term in x^5 to the term in x^3 in the binomial expansion of $(2x + 3)^6$
 (a) $\frac{x^2}{15}$ (b) $\frac{2x^2}{15}$ (c) $\frac{x^2}{5}$ (d) $\frac{2x^2}{5}$
17. Find the fourth term in the expansion of $(3x - y)^6$
 (a) $-540 x^3y^3$ (b) $-540 x^4y^2$ (c) $540x^4y^2$ (d) $540x^3y^3$
18. Find the co-efficient of x^3 in the expansion of $\frac{1}{1+x}$
 (a) -6 (b) -1 (c) 1 (d) 6
19. If the binomial expansion of $(1 - x)^{-\frac{1}{2}}$ is to be used to find an approximate value of $\sqrt{\frac{100}{99}}$, what will be the value of x?
 (a) 0.01 (b) 0.001 (c) -0.01 (d) -0.001
20. If $\sqrt{\frac{4x^2}{3}} + \frac{1}{2} = \frac{7}{6}x$, where $x > 0$, find the value of x
 (a) $\frac{4}{3}$ (b) $3\sqrt{3}$ (c) $3\sqrt{2}$ (d) $\frac{3}{4}$
21. The nth term of the sequence is $2n^2 - n - 1$. If $(n - 1)$ th term is 119, find the value of n.
 (a) 15 (b) 13 (c) 9 (d) 7
22. The sum of two numbers is 24. If one of the numbers is 3 more than twice the other, find the numbers.
 (a) 16 and 18 (b) 19 and 5 (c) 18 and 6 (d) 17 and 7
23. If $P = \{n^2 + 1 : n = 0, 2, 3\}$ and $Q = \{n + 1 : n = 2, 3, 5\}$, find $P \cap Q$
 (a) $\{5, 10\}$ (b) $\{4, 6\}$ (c) $\{1, 3\}$ (d) $\{ \}$
24. Which of the following is a solution of the simultaneous equations $y = x + 3$ and $y = x^2 - x - 12$?
 (a) (5, 8) (b) (3, 6) (c) (1, 4) (d) (0, 3)

25. If the solution set of $x^2 + kx - 5 = 0$ is $\{-1, 5\}$, find the value of k .
 (a) -5 (b) -4 (c) 6 (d) 5
26. Find quadratic equation whose roots are $(2 + \sqrt{3})$ and $(2 - \sqrt{3})$
 (a) $x^2 + 4x + 1 = 0$ (b) $x^2 + 4x - 1 = 0$
 (c) $x^2 - 4x + 1 = 0$ (d) $x^2 - 4x - 1 = 0$
27. Find the minimum value of $y = 3x^2 - x - 6$
 (a) $-6\frac{1}{6}$ (b) $-6\frac{1}{12}$ (c) -6 (d) $-6\frac{2}{6}$
28. If $(1 - x)^{-3} \approx 1 + ax + bx^2$, find the value of $(b - a)$
 (a) 1 (b) 3 (c) 6 (d) -1
29. Find the remainder when $4x^3 - 2x^2 + x - 5$ is divided by $2x - 1$
 (a) $-\frac{9}{2}$ (b) $\frac{9}{2}$ (c) $\frac{2}{9}$ (d) $-\frac{2}{9}$
30. Find the equation of the straight line with gradient $-\frac{3}{4}$ and passing through the point $(-2, -1)$
 (a) $3x - 4y + 10 = 0$ (b) $3x - 4y - 10 = 0$
 (c) $3x + 4y + 10 = 0$ (d) $3x + 4y - 10 = 0$
31. Find the sum of the odd integers from 1 to 49 inclusive
 (a) 525 (b) 600 (c) 625 (d) 1225
32. If $\frac{1}{\sqrt{2}}(3 + x) = \frac{3}{2}\sqrt{2} + 1$, find the value of x
 (a) $x = 2\sqrt{2}$ (b) $x = \sqrt{2}$ (c) $x = \frac{\sqrt{2}}{2}$ (d) $x = \frac{\sqrt{2}}{4}$
33. Find the equation of the straight line which passes through the point M $(-2, 6)$ and N $(4, 2)$.
 (a) $2x + 3y - 14 = 0$ (b) $2x + 3y + 14 = 0$
 (c) $2x - 3y - 14 = 0$ (d) $2x - 3y + 14 = 0$

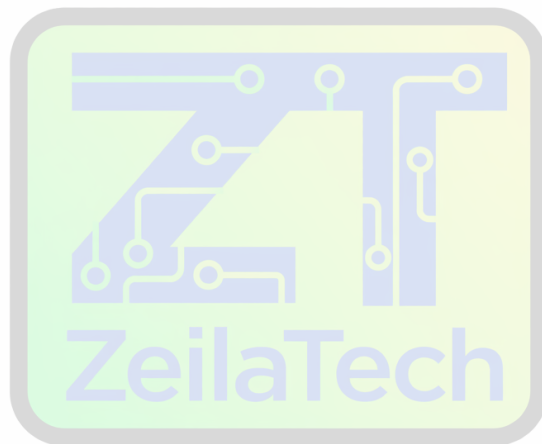
A binary operation $*$ is defined on the set R of real numbers by $m * n = \frac{1}{2} - m + 3n$

Use the information above to answer questions 34 and 35

34. Evaluate $-\frac{2}{3} * 2$
 (a) $7\frac{1}{6}$ (b) $6\frac{3}{5}$ (c) $5\frac{5}{6}$ (d) $4\frac{1}{2}$
35. Find k if $2 * k = -1$
 (a) $k = 6$ (b) $k = \frac{1}{6}$ (c) $k = -6$ (d) $k = -\frac{1}{6}$
36. If a polynomial has the quotient $x^2 - 3x - 4$, a divisor $2x + 1$ and a remainder $\frac{1}{3}$, find the polynomial.
 (a) $6x^3 - 14x^2 - 33x + 11$ (b) $6x^3 - 15x^2 + 33x + 11$
 (c) $6x^3 - 15x^2 - 33x - 11$ (d) $6x^3 - 15x^2 + 33x - 11$

37. Find the sum of the first n term of the sequence $\log x + \log x^2 + \log x^4 + \dots$
(a) $2^n \log x$ (b) $(2^n - 1) \log x$ (c) $n \log x$ (d) $(1 - 2^n) \log x$
38. What would be the value of x if $\frac{-4}{2-\sqrt{3}} = \frac{2+\sqrt{3}}{1-\sqrt{x}}$?
(a) $\frac{25}{16}$ (b) $\frac{16}{25}$ (c) $\frac{5}{4}$ (d) $\frac{4}{5}$
39. Solve for x in $2\sqrt{x} - \sqrt{4x - 11} = 1$
(a) 3 (b) 9 (c) -3 (d) -9
40. If $(x - A)^2 + B \equiv x^2 - 10x + 29$, find the value of $(A + B)$
(a) 9 (b) 8 (c) 7 (d) 6

END OF PAPER



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